

REMARKS

Applicant has amended claims 1, 14, 19 and added new claims 25 and 26. Thus, claims 1-26 are pending in this application.

In the Office Action, the Examiner indicated that claims 6, 7, 11, 14-16 and 21 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant gratefully acknowledges the Examiner's indication of allowable subject matter. Applicant has rewritten claim 14 into an independent claim incorporating parent claims 1 and 3.

The Examiner rejected claim 22 under 35 U.S.C. Section 112, as being indefinite. Specifically, the Examiner believes that it may be inconsistent to refer to a "first spacing pitch" for nozzles and to the same "first spacing pitch" for the pressure chambers. Applicant respectfully submits that it is not inconsistent. For example, in FIG. 4 of the present application, the first spacing pitch P is the same for both the nozzles 24 and pressure chambers 23. Accordingly, applicant respectfully requests withdrawal of the rejection.

The Examiner rejected claims 1-5, 8-10, 12, 13, 17-20 and 22-24 under 35 U.S.C. Section 103(a) as being obvious over Anderson (U.S. Patent No. 5489930). Applicant respectfully traverses the rejection.

The invention according to claim 1 concerns a relatively large-sized ink-jet printing head which has a relatively large number of nozzles and which is easy and economical to develop and manufacture "while maintaining the spacing pitch of the nozzles (dot-to-dot distance)" (see paragraphs 4 and 11). Conventionally, manufacturing such large printing heads suffered from increased defects because of the difficulty in matching the spacing distance between adjacent individual electrodes formed on the fired piezoelectric ceramic plates, with the spacing distance of the adjacent pressure chambers, as the length of the piezoelectric ceramic plates is increased.

According to the invention of claim 1, however, such problem is solved or at least reduced by a novel design that includes a horizontal communication passage between a pressure chamber and a corresponding nozzle (see, for example, paragraphs 52-60). For example, see FIG. 4 (side view) and FIG. 5A (plan view) of the horizontal communication passage 50 which is between the pressure chamber 23 and its corresponding nozzle 24.

Moreover, the spacing pitch between adjacent pressure chambers is P for all except the two adjacent chambers in the middle which is L2 (see FIG. 4). Although the spacing pitch

between adjacent pressure chambers varies to accommodate multiple actuator units, the pitch between any two adjacent nozzles 24 is a constant P. This feature of a constant pitch P between adjacent nozzles with a varied pitch (P or L2) between adjacent pressure chambers in any given row is important because it allows a printhead to be substantially longer than a conventional printhead, thereby substantially increasing the printing speed.

This novel feature is recited in claim 1 as “wherein a spacing pitch of all adjacent pair of said nozzles arranged in each of said at least one row is substantially the same” (emphasis added).

By contrast, the pressure chambers 72 in FIG. 6 of Anderson in any given row (where the nozzle spacing is uniform) have a uniform spacing pitch rather than varied spacing pitch as recited in claim 1.

Specifically, in Anderson, the horizontally extending passage 108 is provided to establish communication between the pressure chambers 72 arranged in eight rows and the nozzles 44 arranged in two rows. That is, the provision of the horizontally extending passage 108 is for enabling the communication between the pressure chambers 72 and the nozzles 44 in spite of difference therebetween with respect to the number of rows.

On the other hand, the at least one horizontally extending portion (50) of each communication passage in the claimed invention is for enabling communication between the pressure chambers (23) of each row which are spaced apart from each other by a varied spacing pitch (P, L2) and nozzles (24) which are spaced apart from each other by a constant spacing pitch (P).

That is, the horizontally extending passage 108 of Anderson is provided for a purpose different from that for the provision of the at least one horizontally extending portion (50) in the claimed invention.

In Anderson, although the pressure chambers 72 are different from the nozzles 44 with respect to the number of the rows in which they are arranged, the pressure chambers 72 of each row and the nozzles 44 of each row are the same to each other with respect to the pitch between each adjacent two of them, which is constant.

Therefore, Anderson fails at least to teach one of the features recited in amended claim 1, which is that “said pressure chambers arranged in each of said at least one row are spaced apart from each other by a first pitch, except at least one adjacent pair of said pressure chambers of

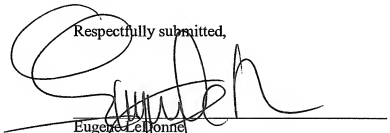
said each of said at least one row which are spaced apart from each other by a second spacing pitch that is larger than said first spacing pitch". Accordingly, Anderson neither teaches nor suggests the novel combination as recited in claim 1.

Similar to claim 1, independent claim 19 recites "wherein said nozzles arranged in each of said at least one row are spaced apart from each other by a first spacing pitch, while at least one adjacent pair of said pressure chambers are spaced apart from each other by a second spacing pitch that is larger than said first spacing pitch" (emphasis added). Again, in FIG. 6 of Anderson, the pressure chambers of Anderson in any given row have a uniform same spacing pitch rather than varied spacing pitch as recited in claim 19. Accordingly, Anderson neither teaches nor suggests the novel combination as recited in claim 19.

Applicant submits that dependent claims 2-5, 8-10, 12, 13, 17-18, 20 and 22-24 are also patentable by virtue of their dependency from independent claims 1 and 19.

Based upon the above amendments and remarks, Applicant respectfully requests reconsideration of this application and its earlier allowance. Should the Examiner feel that a telephone conference with Applicant's attorney would expedite the prosecution of this application, the Examiner is urged to contact him at the number indicated below.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Eugene Leflonne', is written over a horizontal line. The signature is stylized with a large loop at the beginning and a long, sweeping tail.

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